Ontario

MINISTRY OF THE ENVIRONMENT

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HAILEYBURY

WATER TREATMENT PLANT

and

WATER POLLUTION CONTROL PLANT

MINISTRY OF THE ENVIRONMENT

1973 ANNUAL OPERATING SUMMARY

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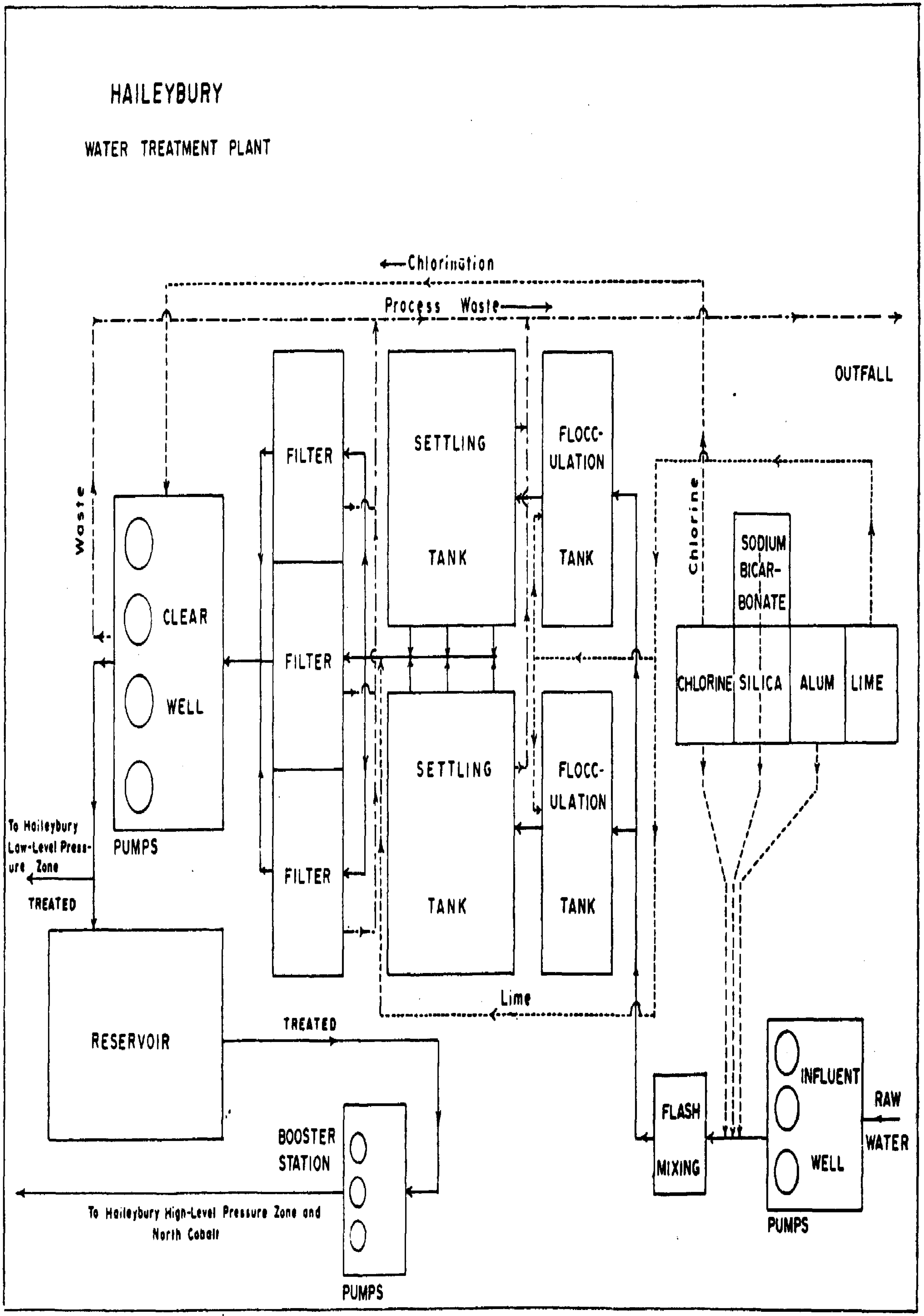
WATER TREATMENT PLANT



HAILEYBURY
WATER TREATMENT PLANT
Chlorination
Process Waste
OUTFALL
Waste
FILTER
FILTER
FILTER
SETTLING TANK
SETTLING TANK
FLOCC-ULATION TANK
FLOCC-ULATION TANK
Chlorine
SODIUM BICAR-BONATE
CHLORINE
SILICA
ALUM
LIME
CLEAR WELL
PUMPS
To Haileybury Low-Level Pressure Zone
TREATED
Lime
RESERVOIR
TREATED
BOOSTER STATION
PUMPS
To Haileybury High-Level Pressure Zone and North Cobalt
FLASH MIXING
INFLUENT WELL
PUMPS
RAW WATER

DESIGN DATA

LAKE TIMISKAMING	
NOMINAL CAPACITY	1.5 MIGD
RAW WATER SOURCE	Lake Timiskaming

INTAKE

910' of 18" dia plastic gravity intake
Design flow 5 MGD

LOW LIFT PUMPING
- 3 submersible pumps
Capacity: 600 GPM ea.

<u>WATER TREATMENT PLANT</u>

FLASH MIXING
Capacity 520 gal

FLOCCULATION TANKS
Size: 15' x 24.5' x 9' (21,000 gal)
Detention: 40 minutes

SETTLING TANKS
Size: 55' x 23'-4" x 9' (154,000gal. tot.)
Overflow rate: 550 gpd/sq.ft.

FILTERS
Type: Gravity Anthracite & Sand
Size: Three 10' x 14'
Filter rate: 2.4 gpm/sq.ft.

CLEAR WELL
Capacity: 55,000 gal.

HIGH LIFT PUMPING
Type: PLEUGER Deep Well Submersible
Capacity: Three 580 IGPM @ 230' TDH
(2.4 MIGD total)

BACKWASH PUMP
Type: PLEUGER
Capacity: 2600 gpm @ 26' TDH

STANDBY POWER
60 cps 3-phase STAMFORD alternator
with 6 cyl. DORMAN diesel

STORAGE
Reservoir 0.4 MG
Old Reservoir: 0.2 M.G.

BOOSTER STATION
Pump Type CRANE vertical turbine
Capacity: Two 700 gpm
One 1350 gpm
Standby power: BEDFORD horizontal Diesel
to #3 pump (1350 gpm)

'73 Review

GENERAL

The Haileybury water treatment plant is a 1.5 million gallon per day complete treatment plant and is designed to provide for an ultimate treatment capacity of 3.0 million gallons per day.

The plant provides complete treatment to the water of Lake Timiskaming which in the untreated state is highly coloured, turbid and aggressive. The treatment process is designed to reduce the aggressive nature of the water and to bring colour, iron and turbidity levels to within the Ministry's water quality standards. Disinfection of the filtered water is effected by gas chlorination.

The treated water is pumped directly to a 600 thousand gallon capacity ground storage reservoir. Water is fed by gravity from this reservoir to the lower sections of the Town of Haileybury. Booster pumps located at the reservoir continuously supply water to areas of the town located at higher elevations.

The plant is staffed by a superintendent, a maintenance man and three operators who divide their duties between the Haileybury water and sewage projects. The plant has had few operating difficulties during the year, and for the most part has provided a good quality water to consumers.

PLANT FLOWS

The total plant output for 1973 was 149.6 million gallons. The maximum daily flow occurred in October and was 0.81 million gallons. The average daily flow of 0.41 million gallons represents 27.3 per cent of the plant design capacity of 1.5 million gallons per day. The maximum daily flow at 0.81 represents 54 per cent of the plant design capacity.

The decrease in consumption from the previous year was due to the fact that the local dairy in Haileybury had closed.

PROCESS CHEMICALS

A total of 7,115 gallons of alum were used as a coagulant during 1973. The average dosage was 31 mg/l with a monthly average dosage range from 22 mg/l to 53 mg/l.

A total of 365 gallons of sodium silicate at an average dosage of 3.4 mg/l and a total of 912 pounds of sodium bicarbonate at an average dosage of 0.6 mg/l were used as flocculation aids.

A total of 19 thousand pounds of lime at an average dosage of 13 mg/l was added to the clear well to control the pH levels in the treated water.

A total of 3513 pounds of chlorine was used for disinfection during 1973. The average dosage of 2.3 mg/l was used to maintain a residual of 0.6 mg/l for the required 15-minute contact period.

WATER QUALITY

The Lake Timiskaming water con be considered very soft, with an average of 30 mg/l hardness as $CaCO_3$. The treated water averaged 46 mg/l hardness as $CaCO_3$ which is also in the "soft" range.

The raw water iron content averaged 0.8 mg/l while the treated water averaged 0.12 mg/l, which is well within the Ministry of the Environment recommended limit of 0.30 mg/l.

The average colour and turbidity concentrations of 5 units and 2 FTU respectively indicate an improvement over the previous years average levels. However, turbidity levels still exceed the recommended Ministry standard of 1 FTU. Expected refinements in the treatment process in 1974 should bring this level within the Ministry standards as well.

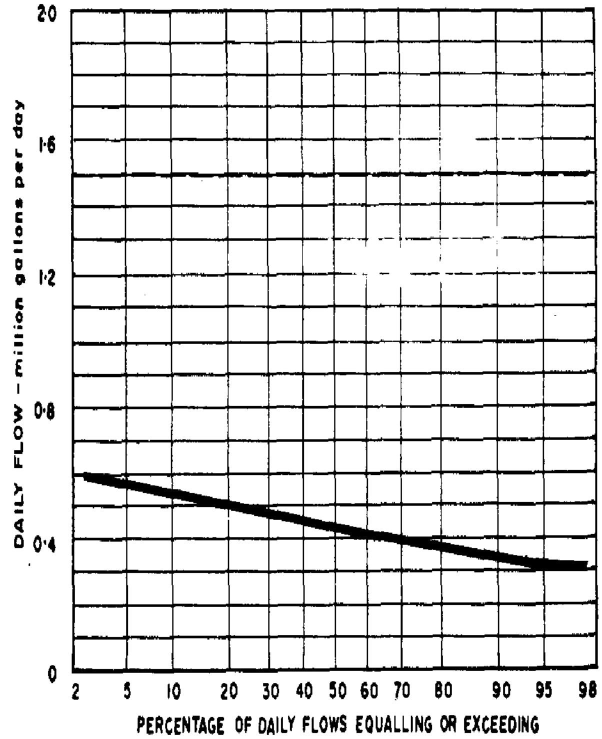
Bacteriological samples collected from the treated water at the plant and the distribution system were all coliform free.

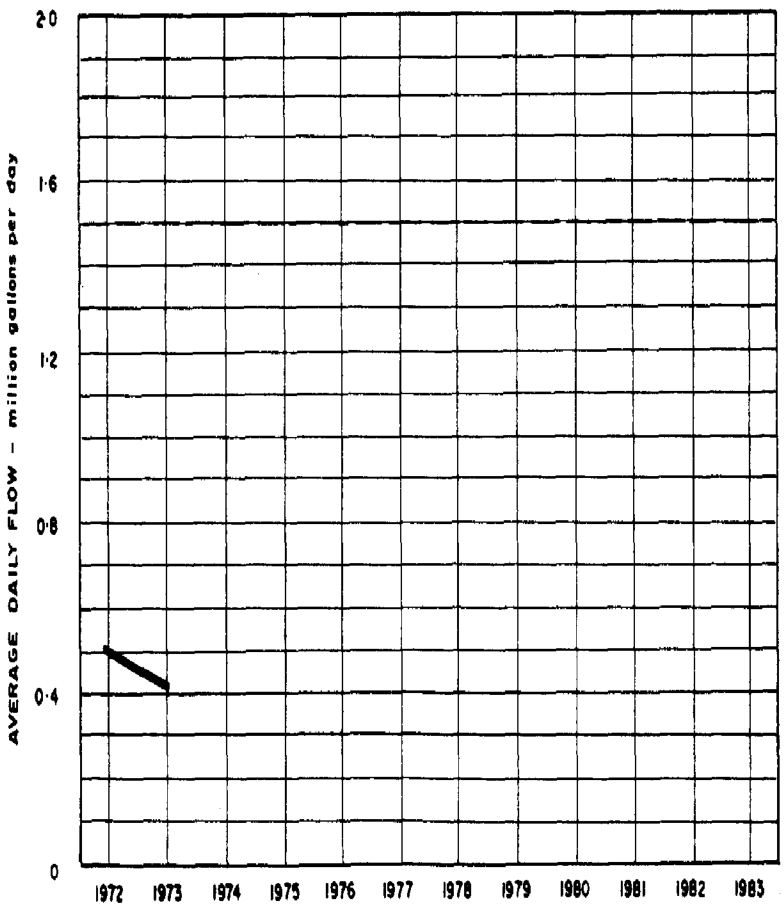
CONCLUSIONS

The plant produced a good quality water for potable purposes during 1973. Turbidity levels were slightly in excess of Ministry standards and it was anticipated that process changes will reduce these levels in 1974.

PROCESS DATA

FLOWS





DESIGN CAPACITY - - - - - - - -

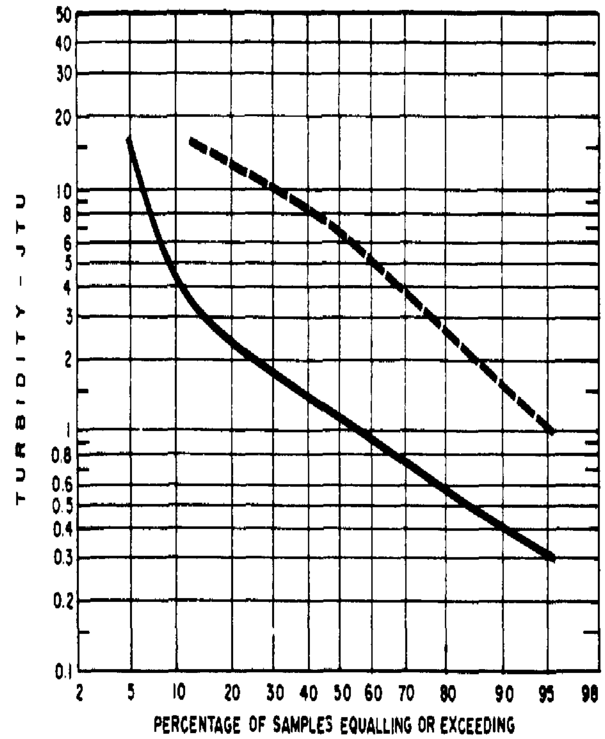
PLANT PERFORMANCE

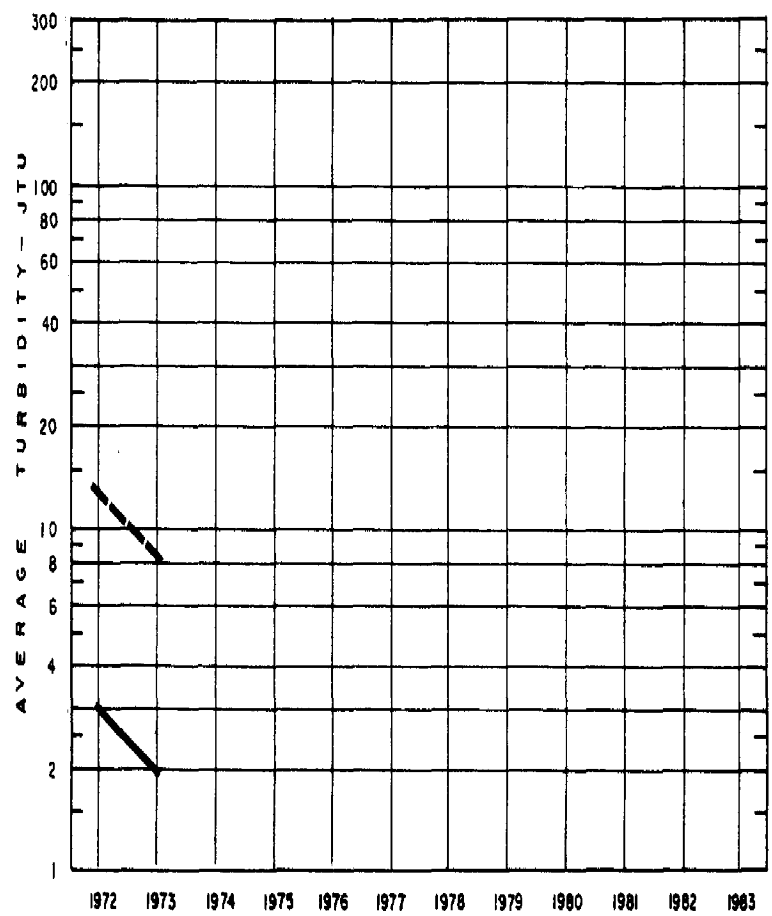
MONTH	FLOWS				RAW WATER		TREATED WATER					
							TURBIDITY		COLOUR		TEMPERATURE	
	TOTAL PLANT OUTPUT million gallons	AVERAGE DAILY FLOW million gallons	MAXIMUM DAY'S FLOW million gallons	MAXIMUM RATE mgd	TURBIDITY (AVERAGE) FTU	COLOUR (AVERAGE) App. units	AVERAGE FTU	MAXIMUM FTU	AVERAGE App. units	MAXIMUM App. units	AVERAGE °F	MAXIMUM °F
JAN	14.3	0.46			9.4	60	2.8	2.8	15	15	34	34
FEB	13.1	0.47	0.53		5.6	60	1.2	1.2	10	10	34	34
MAR	14.5	0.47	0.52		5.5	60	1.2	1.3	< 5	5	34	34
APR	12.8	0.42	0.49		15.0	45	1.3	1.9	< 8	10	35	37
MAY	11.9	0.39	0.45		16.0	35	8.3	15.0	<10	15	42	45
JUNE	11.7	0.39	0.64		7.4	63	1.8	2.0	< 5	< 5	54	63
JULY	13.2	0.43	0.63		6.4	40	0.9	0.9	< 5	< 5	67	68
AUG	11.4	0.37	0.43								68	70
SEPT	11.0	0.37	0.44		4.0	30	0.6	0.8	<5	< 5	62	68
OCT	11.6	0.38	0.81		3.1	40	0.9	1.3	<5	< 5	54	56
NOV	11.7	0.39	0.46		11.0	38	0.9	1.1	<5	< 5	42	50
DEC	12.4	0.40	0.54		9.0	40	2.2	2.4	<5	<5	35	37
TOTAL	149.6											
AVG.		0.41	MAXIMUM 0.81	MAXIMUM	8.3	47	2.0	MAXIMUM 15.0	< 5	MAXIMUM 15	50	MAXIMUM 70

CHLORINATION and DISINFECTION

MONTH	RAW WATER: NUMBER OF SAMPLES HAVING TOTAL COLIFORM ORGANISMS PER 100 ml OF 0	1 - 3	4 - 32	33-320	> 320	PLANT EFFLUENT: NUMBER OF SAMPLES TAKEN	PLANT EFFLUENT: NUMBER HAVING COLIFORM ORGANISMS	DISTRIBUTION SYSTEM: NUMBER OF SAMPLES TAKEN	DISTRIBUTION SYSTEM: NUMBER HAVING COLIFORM ORGANISMS	CHLORINATION: TOTAL AMOUNT OF CHLORINE USED pounds	DOSAGE PRE - mg/l	DOSAGE POST - mg/l	RESIDUAL IN PLANT EFFLUENT mg/l
JAN	0	0	0	0	0	1	0	1	0	214		1.5	0.5
FEB	0	0	0	0	0	2	0	2	0	204		1.6	0.6
MAR	0	0	0	0	0	2	0	2	0	241		1.7	0.6
APR	0	0	0	0	0	2	0	2	0	234		1.8	0.7
MAY	0	0	0	0	0	2	0	2	0	217		1.8	0.5
JUNE	0	0	0	0	0	2	0	2	0	227		1.9	0.6
JULY	0	0	0	0	0	2	0	2	0	339		2.5	0.6
AUG	0	0	0	0	0	1	0	1	0	378		3.3	0.5
SEPT	0	0	0	0	0	2	0	2	0	367		3.3	0.6
OCT	0	0	0	0	0	2	0	2	0	392		3.4	0.7
NOV	0	0	0	0	0	2	0	2	0	365		3.1	0.8
DEC	0	0	0	0	0	2	0	2	0	332		2.6	0.6
TOTAL	0	0	0	0	0					3513			
AVG.	(NOTE - Average shown is the GEOMETRIC MEAN)					22	0	22	0	10 pounds per day		2.3	0.6

TURBIDITY





PLANT INFLUENT

PLANT EFFLUENT

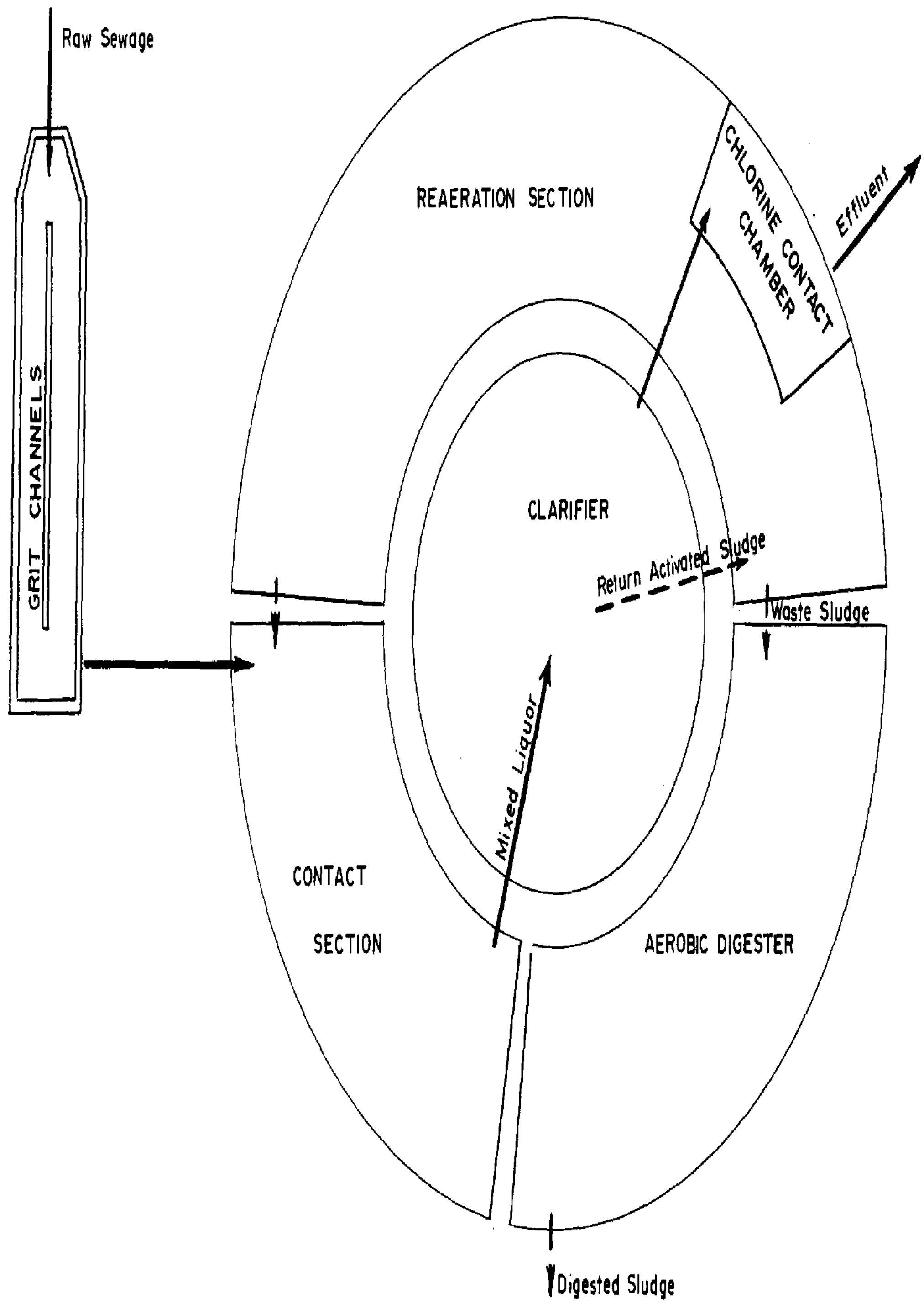
WATER QUALITY

PROPERTY	RAW WATER				TREATED WATER				DESIRABLE STANDARDS
	NUMBER OF SAMPLES	AVERAGE	MAXIMUM	MINIMUM	NUMBER OF SAMPLES	AVERAGE	MAXIMUM	MINIMUM	
HARDNESS in mg/l as $CaCO_3$	21	30	40	17	20	46	56	32	80 - 100
ALKALINITY in mg/l as $CaCO_3$	21	19	29	7	20	22	29	14	30 - 100
IRON in mg/l Fe	21	0.8	1.5	0.5	20	0.12	0.45	< 0.05	Less than 0.3
CHLORIDE in mg/l Cl^-	21	3	7	2	20	4	5	3	Less than 250
pH in pH units	21	7.4	8.4	6.3	20	8.2	9.1	7.1	7.0 - 8.5
FLUORIDE in mg/l F^-	17	0.2	1.0	< 0.1	20	≤ 0.1	0.2	< 0.1	Less than 1.2
ALUMINUM in mg/l Al	7	0.7	1.4	0.4	8	0.5	1.5	0.1	

TREATMENT DATA

MONTH	FILTER OPERATION		CHEMICALS USED					
			ALUM		SODIUM SILICATE SOLUTION		LIME	
	AVERAGE RUN hours	BACKWASH WATER million gallons	AMT. USED 10^3 gallons	DOSAGE mg/l	AMT. USED gallons	DOSAGE mg/l	AMT. USED 10^3 pounds	DOSAGE mg/l
JAN	80	0.32	627	29	31	3.0	1.7	12
FEB	51	0.29	434	22	28	3.0	1.7	13
MAR	54	0.30	833	37	31	3.0	1.7	12
APR	64	0.23	459	23	30	3.3	1.4	11
MAY	54	0.24	466	25	31	3.6	1.4	12
JUNE	60	0.21	475	26	30	3.6	1.4	12
JULY	58	0.21	620	31	31	3.3	1.8	13
AUG	113	0.12	520	30	31	3.9	1.8	15
SEPT	88	0.15	522	31	30	3.8	1.4	13
OCT	70	0.20	589	33	31	3.7	1.6	14
NOV	102	0.14	560	31	30	3.6	1.4	12
DEC	60	0.24	1010	53	31	3.5	1.7	14
TOTAL		2.65	7115		365		19.0	
AVG.	71	0.22	593	31	30	3.4	1.6	13

WATER POLLUTION CONTROL PLANT



HAILEYBURY WPCP

DESIGN DATA

PROJECT NO.	1-0069-67
DESIGN FLOW	0.350 mgd
BOD - Raw Sewage	170 mg/l
- Removal	90%
SS - Raw Sewage	200 mg/l
- Removal	90%

PUMPING STATION

Two - 625 IGPM @ 61 ft TDH
One Diesel engine

GRIT REMOVAL

Type: Manually cleaned channels
Size: Two

SCREENING

Bar Screen 1 3/4" openings

AERATION

Volume: 8,300 ft^3 or 52,400 gal
Detention: 3.6 hr @ 0.35 mgd
Diffusers: S & L Aluminum

REAERATION SECTION

Volume: 21,330 ft^3 or 132,900 gal
Detention: 7.6 hr @ max. return rate of 417,600 Igpd

AEROBIC DIGESTER

Volume: 15,000 ft^3 or 93,400 gal
Loading: 4.3 ft^3/capita

SEDIMENTATION

Volume: 12,100 ft^3 or 75,500 gal
Detention: 5.7 hr @ 350,000 Igpd
Loading: Surface weir

CHLORINE CONTACT CHAMBER

Volume: 8600 gal
Detention: 35 min @ 0.35 mg

'73 Review

GENERAL

The Haileybury sewage project consists of a 350 thousand gallon per day prefabricated contact stabilization treatment plant, and a custom-built sewage pumping station. The plant is operated jointly with the Haileybury water treatment plant and the Haileybury South sewage lagoon project.

The plant was hydraulically overloaded 85 per cent of the time during 1973; however a good quality effluent was produced throughout the year. The final effluent concentrations averaged 6 mg/l and 28 mg/l for BOD and suspended solids respectively.

The Town of Haileybury has applied to this Ministry for an expansion of the plant. This will correct the hydraulic overloading condition, and provide additional treatment capacity for future needs.

PLANT FLOWS AND CHLORINATION

The average daily flow of 502 thousand gallons during 1973 was 143 per cent of the design flow capacity. This represented an increase of approximately 22 per cent over the 1972 average daily flow.

A total of 2580 pounds of chlorine was required at an average dosage of 2.1 mg/l to produce a chlorine residual of 0.5 mg/l in the final effluent. Chlorination was carried out only between the months of March and November.

PLANT EFFICIENCY

The raw sewage BOD and suspended solids concentrations were 130 mg/l and 170 mg/l respectively. The total organic loading was 238,810 pounds of BOD and 312,290 pounds of suspended solids. Of these totals, 227,788 pounds of BOD and 260,854 pounds of suspended solids were removed by the treatment process representing a removal efficiency of 95.4 per cent and 83.5 per cent respectively.

The average BOD and suspended solids concentrations in the final effluent were 6 mg/l and 28 mg/l respectively. The mixed liquor suspended solids concentration averaged 3300 mg/l which was the same level as in the previous year. The F/M ratio averaged 0.12.

SLUDGE DIGESTION AND DISPOSAL

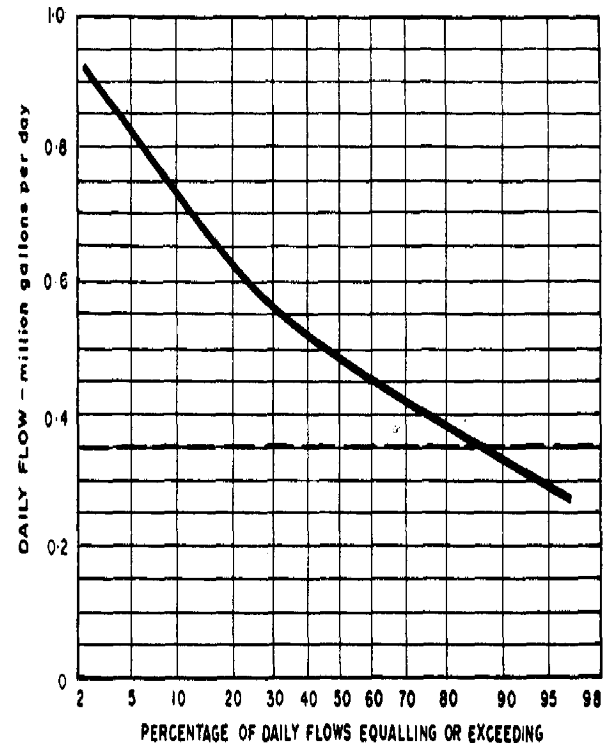
A total of 925 cubic feet of grit was removed from the plant during the year. An estimated total of 42.3 thousand gallons of sludge was wasted to the aerobic digester, and a total of 44 thousand gallons of treated sludge were removed therefrom by tank truck. The volatile solids content of the digested sludge was 48 per cent.

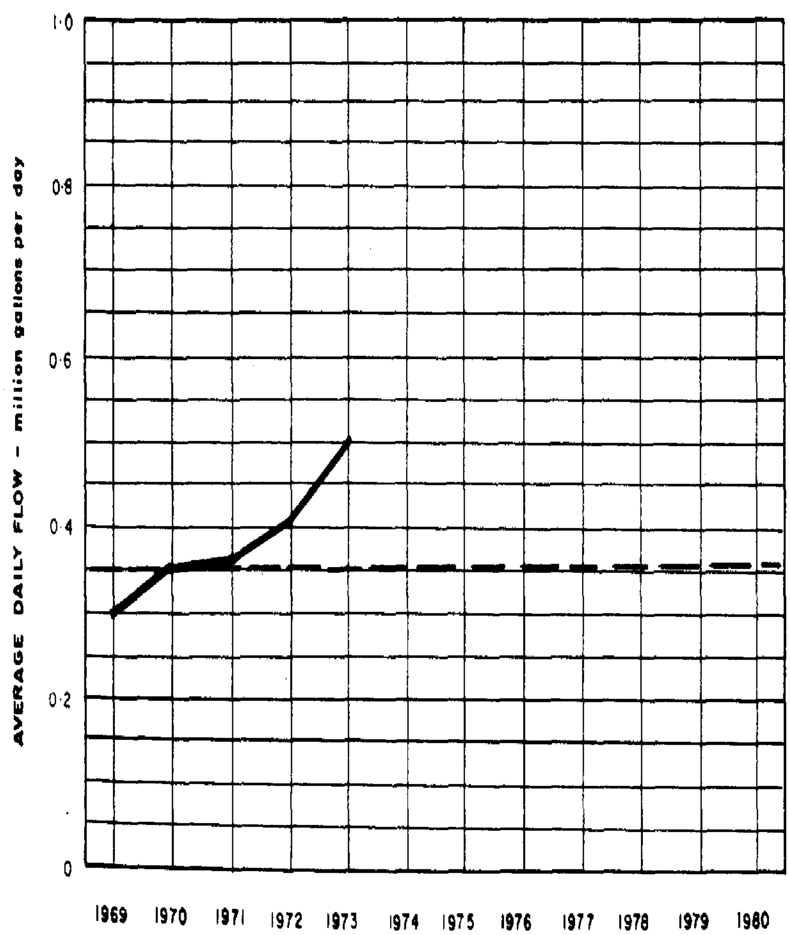
CONCLUSION

The plant has continued to produce a reasonably good quality effluent during the year. However, the average of 28 mg/l suspended solids in the final effluent exceeded this Ministry's standard of 15 mg/l. This is directly attributed to the hydraulic overload on the plant.

PROCESS DATA

FLOWS





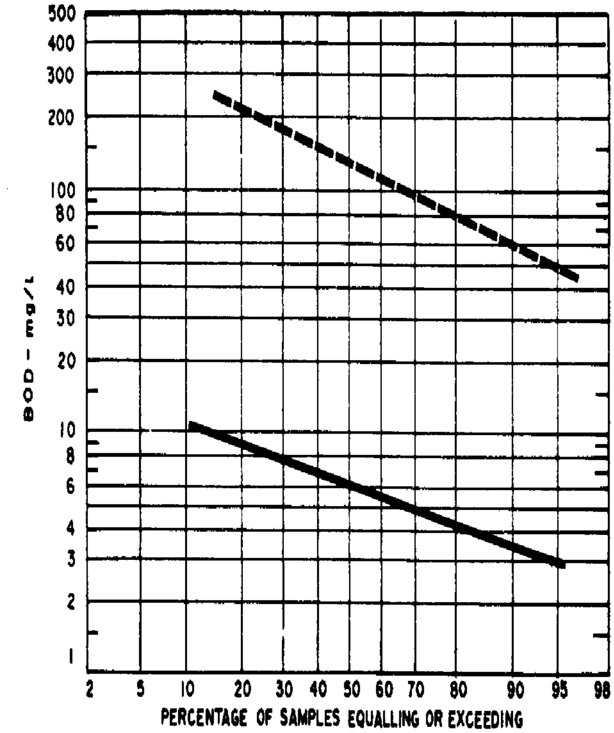
DESIGN CAPACITY - - - - - - -

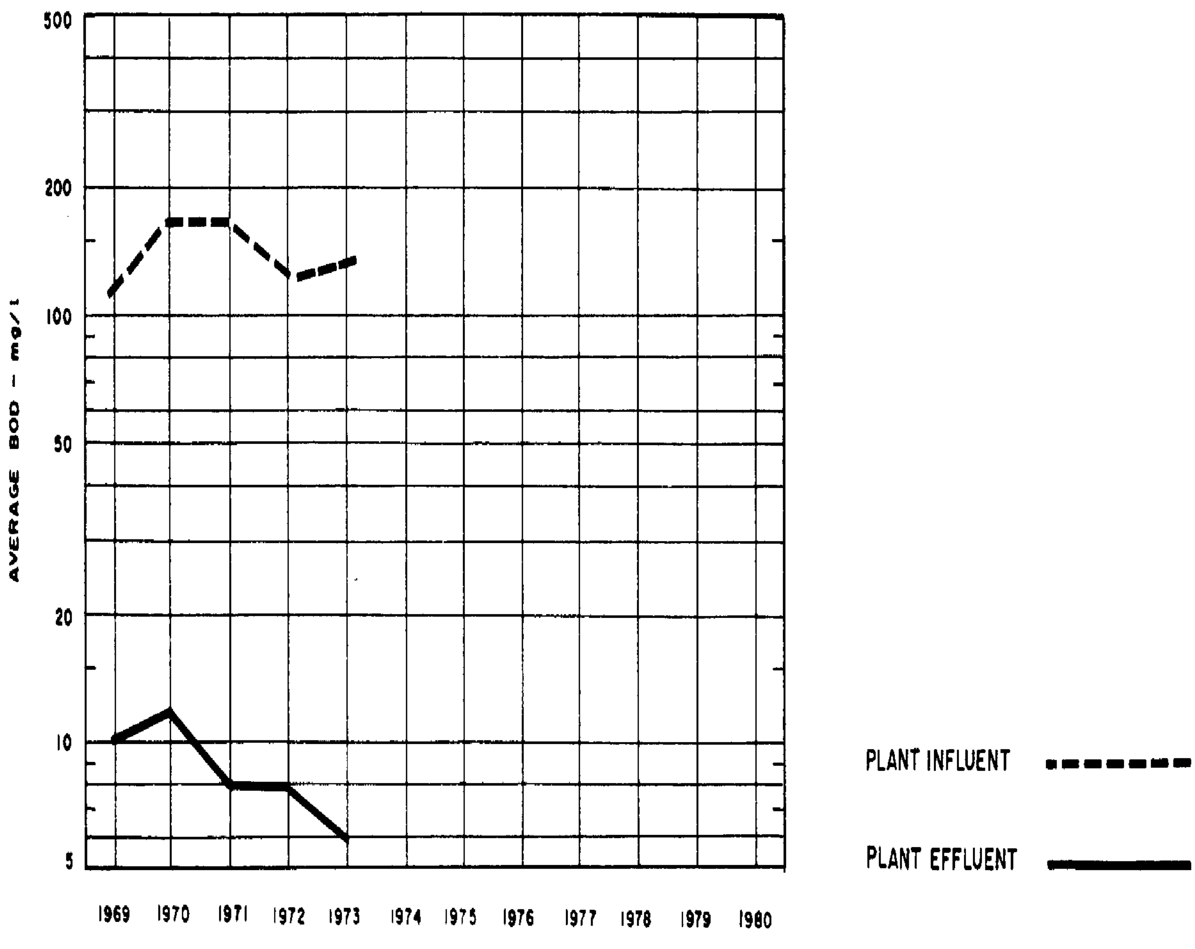
PLANT PERFORMANCE

MONTH	FLOWS: TOTAL FLOW million gallons	FLOWS: AVERAGE DAY mil. gal	FLOWS: MAXIMUM DAY mgd	BIOCHEMICAL OXYGEN DEMAND: INFLUENT mg/l	BIOCHEMICAL OXYGEN DEMAND: EFFLUENT mg/l	BIOCHEMICAL OXYGEN DEMAND: REDUCTION %	BIOCHEMICAL OXYGEN DEMAND: REDUCTION 10^3 pounds	SUSPENDED SOLIDS: INFLUENT mg/l	SUSPENDED SOLIDS: EFFLUENT mg/l	SUSPENDED SOLIDS: REDUCTION %	SUSPENDED SOLIDS: REDUCTION 10^3 pounds	PHOSPHORUS: INFLUENT mg/l P	PHOSPHORUS: EFFLUENT mg/l P
JAN	14.7	0.48	0.78	200	10	95	28	160	10	94	22	8.8	3.3
FEB	11.6	0.42	0.54	160	7	96	18	120	10	91	12	9.3	3.6
MAR	17.1	0.55	0.81	78	10	87	12	270	195	28	12	5.1	1.5
APR	23.4	0.78	0.92	120	5	96	26	120	10	92	26	7.5	1.9
MAY	23.9	0.77	1.12	140	5	96	31	140	20	85	28	5.6	1.0
JUNE	15.2	0.50	0.62	140	3	98	22	320	8	97	47	7.6	2.0
JULY	11.7	0.38	0.57	130	4	97	14	120	5	96	13	5.7	2.8
AUG	11.5	0.37	0.52										
SEPT	11.1	0.37	0.41	200	3	99	22	200	10	95	22	6.6	4.2
OCT	14.5	0.43	0.57	140	3	98	21	150	13	91	20	6.9	2.5
NOV	16.0*	0.52	0.68	93	8	91	13	88	13	85	12	5.5	1.1
DEC	13.0*	0.43	0.58	100	5	95	13	120	10	92	15	6.1	2.2
TOTAL	183.7	-	-	-	-	-		-	-	-		-	-
AVG.		0.50	MAXIMUM 1.12	130	6	95	21	170	28	84	22	6.7	2.3
No. of Samples	-	-	-	20	20	-	-	22	20	-	-	20	19

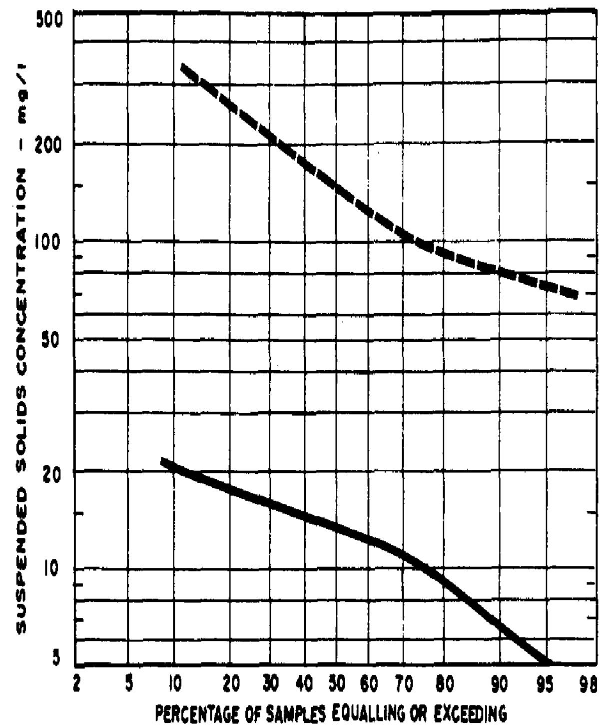
* Estimate

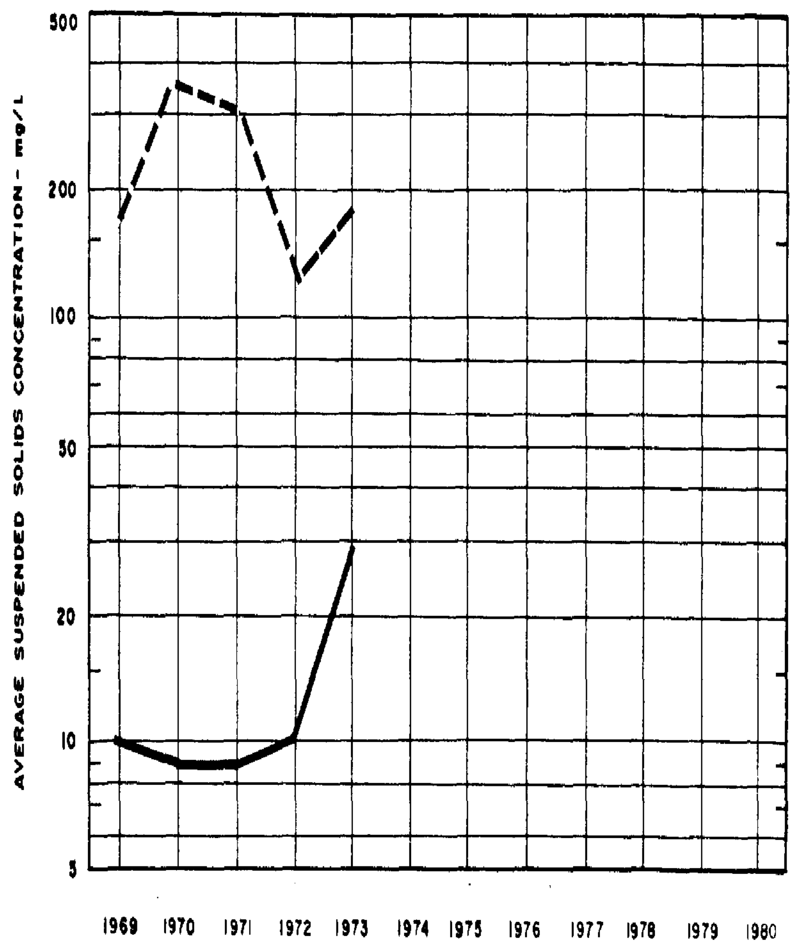
BIOCHEMICAL OXYGEN DEMAND





SUSPENDED SOLIDS

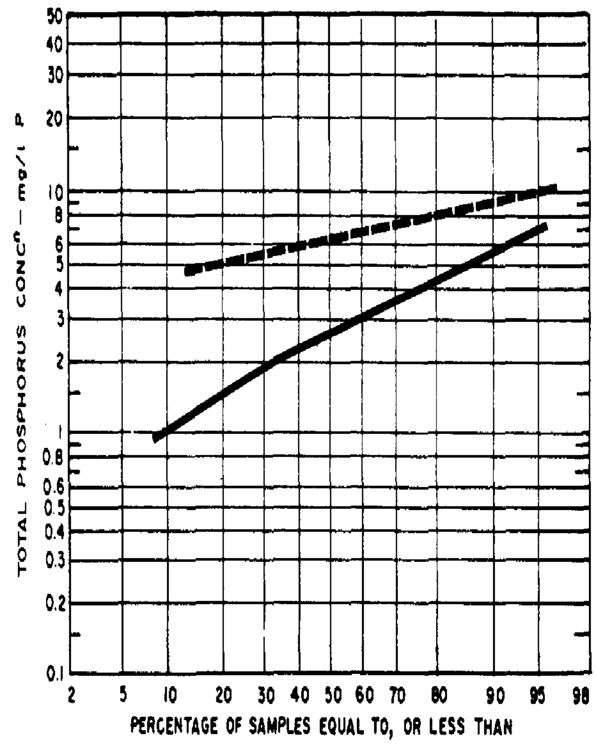


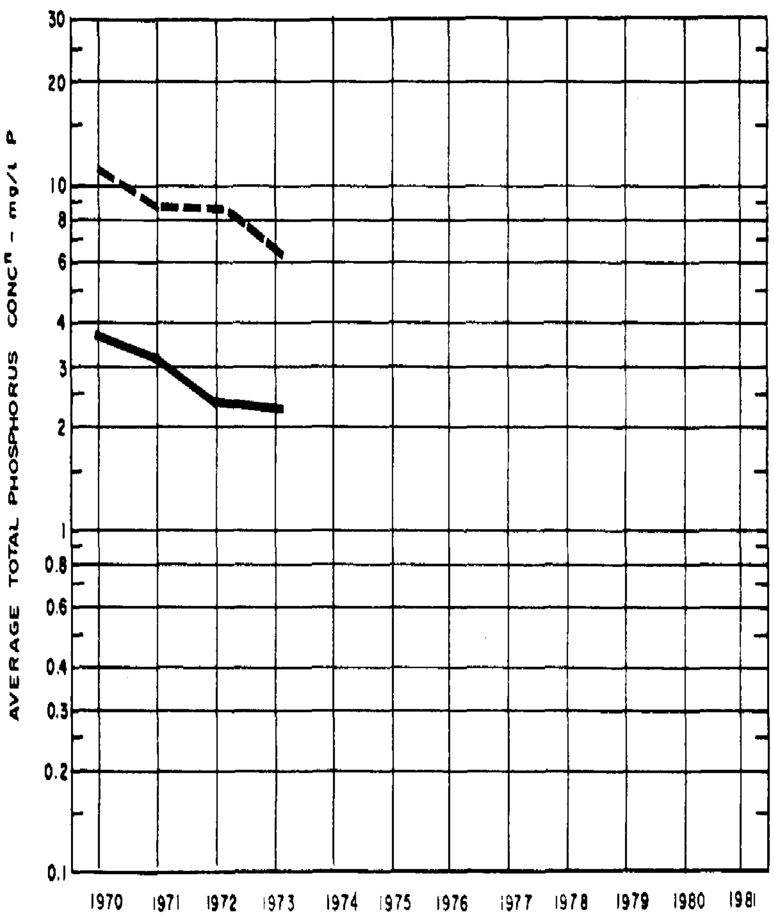


PLANT INFLUENT

PLANT EFFLUENT

PHOSPHORUS





PLANT INFLUENT

PLANT EFFLUENT

TREATMENT DATA

MONTH	GRIT	CHLORINATION		AERATION			WASTE SLUDGE			AEROBIC DIGESTER			
	QUANTITY REMOVED cubic feet	Cl_2 USED pounds	AVG. DOSAGE mg/l	MLSS. CONC mg/l	F/M * day^{-1}	AIR USED $\frac{1000\ ft^3}{lb\ BOD}$	QUANTITY 10^3 gallons	SUSPENDED SOLIDS mg/l	VOL. SOLIDS %	QUANTITY REMOVED 10^3 gallons	SUSPENDED SOLIDS mg/l	VOL. SOLIDS %	AMOUNT HAULED cubic yards
JAN	108			2800	0.19	0.8	5.0				16000	44	
FEB	75			2900	0.12	1.7	2.8				22000	48	
MAR	66	350	2.3	2200	0.10	1.7	0.5				13000	45	
APR	87	340	1.4	2600	0.19	0.7	3.0				21000	47	
MAY	90	290	1.2	2700	0.21	0.8	0.5				18000	45	
JUNE	75	310	2.1	3400	0.12	1.7	8.0				5000	54	
JULY	81	300	2.6	4300	0.06	2.7	9.5				5000	50	
AUG	65	260	2.3	4300			3.0						
SEPT	60	280	2.5	5000	0.08	1.7	8.0				11000	51	
OCT.	68	340	2.3	3500	0.10	2.0	2.0				8800	50	
NOV	84	110	1.9	3000	0.09	2.8	0				5500	53	
DEC	66			3100	0.08	3.1	0				4600	51	
TOTAL	925	2580	-	-	-	-	42.3	-	-		-	-	
AVG.	5.0 cu. ft/mil gal	290	2.1	3300	0.12	1.8					15000	48	

* Reaeration Tank contents estimated to be twice Mixed Liquor concentration.